REMARKS

Claim 7 has been cancelled and claim 13 has been added. No new matter is added by virtue of these amendments. Support for new claim 13 appears throughout the specification and in original claim 7.

Referring with particularity to the Office Action, claim 7 stands rejected under 35 USC 112, 2nd paragraph. Applicants have cancelled claim 7, and rewritten the subject matter thereof in new claim 13, merely to clarify and further define the features recited therein. Reconsideration and withdrawal of the rejection is therefore requested.

The remaining rejections relate to prior art and are discussed in combination. Each of the rejections is traversed.

Claims 1 and 9 stand rejected under 35 USC 102(b) over Shiraiwa (US Patent 6,201,893).

Claims 11 and 12 stand rejected under 35 USC 103(a) over Shiraiwa (US Patent 6,201,893) in view of Kuo (US Patent 5,982,926).

Claims 2, 6, 8 and 10 stand rejected under 35 USC 103(a) over Shiraiwa (US Patent 6,201,893) in view of Tokuyama (US patent 6,240,206).

Claim 3 is rejected under 35 USC 103(a) over the combination of Shiraiwa (US Patent 6,201,893) and Tokuyama (US patent 6,240,206) and further in view of Takagi (Selective Image Sharpening", Image Analysis Handbook. University of Tokyo Press, page 549 (1991)).

Claims 4 and 5 stand rejected under 35 USC 103(a) over the combination of Shiraiwa (US Patent 6,201,893) and Tokuyama (US Patent 6,240,206) and further in view of Pollard US Patent 6,266,439) and Katsuama (US Patent 6,035,061).

Claim 7 is rejected under 35 USC 103(a) over the combination of Shiraiwa (US Patent 6,201,893) and Tokuyama (US patent 6,240,206) and further in view of Yamazaki (US Patent 5,801,791).

Before addressing the prior art rejections, a brief summary of Applicants' invention is offered.

Applicants have discovered a highly improved image processing device. Devices of the invention have nonlinear gradation characteristics and comprise (i) a contrast estimation unit which estimates the contrast of the image represented by the image data input from an image input device; and (ii) a luminance correction unit that subjects the pixel data constituting the image data to a luminance conversion process on the basis of the estimated contrast and the gradation characteristics. Also in accordance with the present invention, the pixel data may optionally be subjected to a sharpening process. The level of sharpening performed for one or a plurality of character regions in the image represented by the image data is higher than that for the pixel data of the pixels in remaining regions other than the character regions in the image. The image data comprising the pixel data subjected to these processes is supplied to the display device. In that way, the visibility and quality of the image displayed on the display device is significantly improved.

The novel design of the present invention provides significant advantages over the image processing devices of the prior art. Devices and methods of the present invention avoid several problems observed in connection with conventional image processing devices, including reduced visibility of the image attributable to one or more of the bias of the gradation characteristics, the contrast of the image and the resolution of the image.

The cited documents do not teach or suggest Applicant's claimed invention in a manner sufficient to sustain a rejection under 35 U.S.C. §102 or §103.

As the §102 rejection is understood, several features of Shiraiwa's device are identified as being allegedly analogous to the features of the present invention.

Applicants submit that Shiraiwa discloses an image reproduction apparatus which is distinct from the present invention. For example, the Shiraiwa reference fails to teach contrast estimation means which is a feature of the present invention (see claims 1 and 9). Indeed, Shiraiwa does not even mention the term "contrast". Shiraiwa merely reports a luminance frequency distribution histogram, which is not analogous to the contrast estimation means of the present invention.

Shiraiwa also does not teach or suggest the luminance correction means recited in independent claims 1 or 9 of the present invention. The Office Action asserts that some combination of Shiraiwa's parameter determination section and processing sections are somehow analogous to the present invention's luminance corrections means. However, these respective features are quite distinct from the present invention.

The present invention recites a luminance correction means that not only raises the contrast of the image on the basis of estimated contrast but also corrects luminance of each of the pixels constituting the image based on the gradation characteristics. Therefore, the image processing device of the present invention can always improve the contrast of the image regardless of how high a contrast the image has. Additionally, the characters drawn in the image displayed on the display means are easy to read regardless of the bias of the gradation characteristics of the display means. These are significant advantages over conventional devices, such as that reported in Shiraiwa. Such features are not taught or suggested by Shiraiwa. (See the related discussion of the luminance correction means beginning on page 16 of the present application.)

Elaborating on the above discussion, Shiraiwa (USP 6,201,893) discloses an image reproduction apparatus and method for converting an image taken by an imaging means into an

image signal that can be visibly output, by employing image reproduction parameters obtained from a plurality of image data.

Referring again to the Office Action, the position is taken that the distribution (histogram) of luminance levels of an image as disclosed in Shiraiwa (see the Shiraiwa at column 6, lines 53 to 56) is analogous to the contrast of an image as disclosed in the present invention, and the image-pickup-data-holding section (element 31 of Fig. 1) disclosed in Shiraiwa is analogous to contrast estimation means as stated in the present invention according to claim 1. Even if such analogies can be made, in Shiraiwa's description concerning the distribution (histogram) of luminance levels of an image, there is no disclosure with respect to the contrast of an image.

Additionally, with respect to the function of the image-pickup-data-holding section 31, there is only a description as to holding image pickup data from the image-pickup-data-memory unit 20 (see Shiraiwa at column 4, lines 2 to 3, and column 6, lines 64 to 67). Clearly, the image-pickup-data-holding section 31 of Shiraiwa cannot be equated to the contrast estimation means of the present invention.

Further, the Office Action takes the position that Shiraiwa also discloses luminance correction means for raising the contrast of the image on the basis of estimated contrast (see column 7, lines 15 to 26). However, in Shiraiwa, there is only a description as to performing luminance-distribution-smoothing processing on the basis of the luminance histogram. The luminance-distribution-smoothing processing is for performing image comparison based on luminance among a plurality of image data (see Shiraiwa at column 7, lines 15 to 26). Such a feature cannot be considered analogous to, nor does it even relate to, the contrast estimation means of the present invention.

Still further, Shiraiwa provides no teaching or suggestion with respect to the effect of "preventing visibility reduction of an image caused by the contrast of an image and the gradation

characteristics of display means is possible". The aforementioned effect is achieved by combining two features of the present invention according to claim 1. The first is "raising the contrast of the image on the basis of estimated contrast"; and the second is "correcting luminance of each of the pixels constituting the image based on the gradation characteristics". These features are described in the invention recited in claim 1 with respect to the luminance correction means.

Accordingly, the §102 rejection is properly withdrawn. (See, *In re Marshall*, 198 USPQ 344, 346 (CCPA 1978) ("[r]ejections under 35 U.S.C. §102 are proper only when the claimed subject matter is identically disclosed or described in the prior art."))

Each of the remaining references cited are secondary to that of Shiraiwa. Given the deficiencies of the Shiraiwa disclosure, each of those references provides insufficient basis to sustain the §103 rejections.

For instance, Kuo is added merely for its report of a contrast enhancing method and does not remedy the deficiencies of Shiraiwa. Kuo's method is distinct from that of the present invention and does not teach or suggest the contrast estimation means and luminance correction means recited in claims 11 and 12 of the present invention.

Indeed, even the Office Action expressly acknowledges that Shiraiwa does not define the contrast in terms of a luminance corresponding to lines and dots in the image and a luminance corresponding to the background of the image, as in the present invention. The Office Action also expressly concedes that Shiraiwa fails to disclose that the contrast of the image is raised to a maximum contrast corresponding to a lower limit of luminance (Vmin) and an upper limit of luminance (Vmax). However, the position is taken that Kuo provides disclosure of the foreground of a textual image document which allegedly is analogous to the lines and dots generated in the input image; and further that the luminance term ymin from Kuo is analogous to

Lv of the present application. Given the deficiencies of the Shiraiwa reference stated above, Kuo cannot support the instant rejection.

Tokuyama is added for its report of a character region extracting means for extracting character regions from an image and a sharpening means. The Office Action goes on to allege that those features are analogous to certain features of the present invention.

Tokuyama discloses the following: the reference document is received, and the region separation is carried out. The automatic adjusting section 13 prepares a histogram from the result of the region separation, and stores frequencies (the number of pixels) of the character region, the photographic regions, and the spot region as A, B, and C, respectively. There, a region separation state which has been stored beforehand, namely, preset values of the frequencies of the photographic region, the character region, and the spot region are AR=500000, BR=250000, and CR=250000, respectively. The automatic adjusting section calculates the difference between (1) the count A, B, and C of the region separation and (2) the above-noted region separation state to give XA, XB, and XC. Namely, XA=A-AR, XB=B-BR, and XC=C-CR. According to Tokuyama, it is preferable that the ratios of the differences thus determined to the preset values (=XA/AR, XB/BR, XC/CR) fall within plus and minus 10 per cent. The ratios determined in this manner become target values of the region separation, i.e., the specified ratio. In the case where the ratio is larger than plus and minus 10 per cent, the filter is changed (see Tokuyama at column 8 line 66 to column 9 line 23, column 11 lines 38 to 44, and column 11 line 65 to column 12 line 14).

Tokuyama is directed to counting the number of pixels in each of the separated regions and uses the number of pixels thus counted to change a filter so as to adjust the separated state of each region such that the number of pixels thus counted is substantially equal to the number of pixels of the region separation state, thereby improving the accuracy of region separation. In the case where the ratio of the difference to the aforementioned setting value is within plus and minus 10 per cent, the processing for the separation state is not carried out because the region separation state is considered good.

According to Tokuyama, with respect to a character region, in addition to a correction for increasing the degree of enhancement, an adjustment for reducing the degree of enhancement is also carried out. Tokuyama is therefore plainly distinct from the present invention as recited in claims 2, 6, 8 and 10. In particular, Tokuyama does not teach or suggest the sharpening means for carrying out sharpening for the remaining regions other than the character region in the image at a predetermined sharpening level and for carrying out sharpening for the character region at a sharpening level higher than the level of the sharpening performed for the remaining regions.

Takagi is added to the Shiraiwa and Tokuyama references, for its report of the formula utilized by the sharpening means to obtain the luminance values of the present invention.

Pollard is added merely for its disclosure of conversion of pixels of the image into binary form.

Katsuyama is added for its disclosure of extracting regions which are nearly parallel with a predetermined axis line as character regions. The Office Action asserts that the table ruled lines of Katsuyama are allegedly analogous to the predetermined reference axis lines that arrange regions in parallel as in the present invention.

Yamazaki is cited for its disclosure of splitting a histogram into two ranges based on the average brightness of the input data, and for using a maximum value and minimum value from the ranges in order to estimate contrast.

Given the deficiencies of the Shiraiwa reference stated above, the Tokuyama, Takagi, Pollard, Katsuyama and Yamazaki references cannot support the instant rejections.

It is well-known that to establish a prima facie case of obviousness, three basic criteria must be met: (1) there must be some suggestion or motivation, either in the references
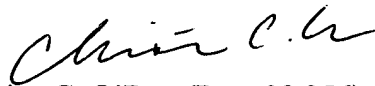
themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; (2) there must be a reasonable expectation of success; and (3) the prior art reference(s) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). See MPEP § 2143.

There is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the cited references to make the claimed invention, nor is there a reasonable expectation of success.

In view thereof, reconsideration and withdrawal of the §103 rejections are requested.

It is believed the application is in condition for immediate allowance, which action is earnestly solicited.

Respectfully submitted,

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